mask, and the parent pattern of the master mask is transferred onto a second substrate through a reduction projection optical system under a second condition set in accordance with the first condition, thereby forming the photomask.

Page 8, lines 11-22, delete current paragraph and insert therefor:

Next, a second producing method of a photomask according to the present invention is a producing method of a photomask on which a pattern to be transferred through a projection optical system under a predetermined first illumination condition is formed, wherein a parent pattern obtained by enlarging the pattern is formed on a first substrate, thereby forming a master mask, and the parent pattern of the master mask is transferred onto a second substrate through a reduction projection optical system under a second illumination condition set such as to compensate a variation in a projection image under the first illumination condition, thereby forming the photomask.

Page 9, lines 20-24 through Page 10, lines 1-14, delete current paragraph and instert therefor:

Next, a first producing apparatus of a photomask according to the present invention is a producing apparatus of a photomask on which a pattern to be transferred through a projection optical system under a predetermined first illumination condition is formed, comprising a mask stage which holds a master mask on which a parent pattern obtained by enlarging the pattern is formed, an illumination optical system which illuminates a mask on the mask stage under any one of a plurality of illumination conditions, a control system which sets a second illumination condition selected out of the plurality of illumination conditions so as to compensate a variation in a projection image caused under the first illumination condition to the illumination optical system, and a reduction projection optical system which transfers an image of a pattern of a mask on the mask stage on a predetermined substrate.

a4 According to this producing apparatus of the present invention, it is possible to carry out the photomask producing method of the present invention.

Page 10, lines 15-24 through Page 11, lines1-9, delete current paragraph and insert therefor:

Next, a producing method of a device according to the present invention is a producing method of a predetermined device, comprising a first step forming a first pattern obtained by enlarging a pattern of a predetermined layer of the device α times (α is a real number greater than 1) and setting a first illumination condition when the first pattern is illuminated, a second step of drawing a parent pattern by enlarging the first pattern β times (β is a real number greater than 1) onto a single or a plurality of first substrates to form a master mask, a third step of transferring an optical image obtained by reducing a pattern of the master mask $1/\beta$ times under a second illumination condition set such a to compensate a variation in a projection image by the first illumination condition, onto a second substrate to form a working mask, and a fourth step of transferring an image obtained by reducing a pattern on the working mask $1/\alpha$ times under the first illumination condition onto the third substrate.

Page 11, lines 19 -25 through Page 12 lines 1-7, delete current paragraph and insert therefor:

Next, a third producing method of a photomask of present the invention is a producing method of a photomask having a pattern to be transferred onto a light-sensitive substrate by an exposure apparatus used for producing a device, wherein a master mask on which as least a portion of a parent pattern obtained by enlarging the pattern to be formed is disposed at an object plane side of a projection optical system, the master mask is illuminated under an illumination condition according to a proximity degree of the at least the portion of the parent

pattern is transferred through the projection optical system onto a photomask-producing substrate disposed at an image plane side to produce the photomask.

Page 12, lines 13-24 through Page 13, lines 1-4, delete current paragraph and insert therefor:

Next, a second producing apparatus of a photomask according to the present invention is a producing apparatus of a photomask having a pattern to be transferred onto a light-sensitive substrate by an exposure apparatus used for producing a device, comprising: an illumination optical system which illuminates a master mask on which at least a portion of a parent pattern obtained by enlarging the pattern, a projection optical system which projects a reduced image of the master mask onto a photomask-producing substrate , and an adjusting apparatus which sets an illumination condition of the master mask to the illumination optical system in accordance with proximity degree of the at least the portion of the parent pattern. According to the producing apparatus of the present invention, it is possible to carry out the photomask producing method of the present invention.

Page 13, lines 17-23 through Page 14, lines 1-3, delete current paragraph and insert therefor:

Fig. 1 is a schematic constitutional view showing a producing apparatus of a working reticle used in one example of a preferred embodiment of the present invention. Figs. 2A, 2B1, 2B2, 2C1, and 2C2 are views for explaining a method of correcting deformation of a pattern due to an optical proximity effect generated when a mask pattern is transferred. Fig. 3 is a view showing one example of a design a master reticle. Fig. 4 is a view showing one example of a producing step of a working reticle and a semiconductor device.

Page 23, lines 18-24 through Page 25, lines 1-13, delete current paragraph and insert therefor:

Fig. 2A shows the master reticle MR. In Fig 2A, in the master reticle MR, a parent pattern 41 comprising patterns P1A to P5A is formed on a substrate 40. The parent pattern 41 is obtained by enlarging, in a similarity manner, a circuit pattern of a certain layer of a semiconductor device which is to be finally produced. The parent pattern 41 has a size of $\alpha \cdot \beta$ times enlarged circuit pattern of a semiconductor device to be produced finally, using the reduction magnification $1/\alpha$ of the semiconductor device producing projection exposure apparatus (projection optical system 33 in Fig. 4) and the reduction magnification $1/\beta$ of the working reticle producing projection exposure apparatus (projection optical system 6 in Fig. 1). Although each pattern constituting the parent pattern 41 is illustrated with a thick line width as a matter of convenience, the pattern is fine having a width in the order of μm in reality. Although the Fig 2A, Figs 2B1 and 2B2 and Figs. 2C1 and 2C2 have actually different magnifications from one another, these drawings are illustrated with the same magnification as a matter of convenience.

Page 24 lines 14 - 24 through Page 25 lines 1-11, delete current paragraph and insert therefor:

Conventionally, uning the value "α times" which is a reciprocal of the reduction magnification $1/\alpha$ of the projection optical system 33 shown in Fig. 4, as shown in Fig. 2B2, a mask pattern 41B2 obtained by enlarging α times, a circuit pattern of a semiconductor device to be finally produced is drawn on a substrate to produce a working reticle WR'. Patterns P1B' to P5B' constituting the mask pattern 41B2 are also patterns respectively obtained by reducing the patterns P1A to P5A of the parent pattern 41 shown in Fig. 2A, $1/\beta$ times precisely. However, if the mask pattern 41B2 of the working reticle WR' is transferred, the pattern formed on the wafer is deformed by the optical proximity effect in some cases. Especially in the case of a recent semiconductor device producing projection exposure

apparatus, the illumination condition is set to a condition in which the coherence factor (σ value) is great ($1 \geq \sigma \geq 0.7$) or deformed illumination such as circular zone plate illumination is used so as to enhance the resolution. Therefore, of the patterns to be transferred, an image of a portion (isolated portion) where another pattern does not exist in the vicinity thereof is transferred to be thinned by the optical proximity effect.

Page 25 lines 12-24 through Page 26 lines 1-5, delete current paragraph and insert therefor:

Fig. 2C2 shows a pattern 41C2 formed on a wafer when the mask pattern 41B2 of the working reticle WR' in Fig 2B2 is exposed under an illumination condition having great σ value ($1 \geq \sigma \geq 0.7$). In Fig. 2C2 isolated portions of the patterns P1C', P2C' and P3C' of the pattern 41C2 are transferred to the thinned by the optical proximity effect. One the other, hand periodical protion of the pattern P1C' and periodical patterns P4C' and P5C' are transferred with original line widths. Conventionally, in order to correct the pattern deformation caused by the optical proximity effect, the OPC (Optical Proximity Correction) processing is applied, and when the mask pattern of the working reticle is drawn, a correction is made such that a line width of an isolated portion of the mask pattern is previously thickened. However, as explained above, if the OPC processing is applied, the amount of correction data of the pattern is enormously increased, and the drawing time is extremely increased.

Page 26 lines 6-20, delete current paragraph and insert therefor:

Thereupon, in this example, using the master reticle MR in Fig 2A, an illumination condition of the working reticle producing projection exposure apparatus is set in accordance with an illumination condition of the semiconductor device producing projection exposure apparatus, thereby correcting the pattern deformation caused by the optical proximity effect

when the mask pattern of the working reticle is transferred. For example, in the case of the illumination optical system 31 shown in Fig. 4 of the projection exposure apparatus of the present example, since the illumination condition is set to a condition in which the coherence factor (σ value) is great ($1 \geq \sigma \geq 0.7$) to enhance the resolution, the illumination condition of the projection exposure apparatus shown in Fig. 1 is set to a condition having small σ value $0.1 \leq \sigma \leq 0.4$).

Page 26 lines 21-24 through Page 27 lines 1-16, delete current paragraph and insert therefor:

In this case, if the σ value is smaller than 0.1, the amount of light of the exposure light is reduced, and the influence of aberration of the projection optical system is increased. If the σ value is greater than 0.4, the influence of the optical proximity effect is reduced, and sufficient correction amount can not be obtained. Under a condition of small σ value, the parent pattern 41 of the master reticle MR shown in Fig. 2A was reduced and projected on the substrate 26, and it was developed and etched. As a result, as shown in Fig. B1, the mask pattern 41B1 is formed on the working reticle WR. In the working reticle WR shown in Fig. 2B1, since the σ value is small, the optical proximity effect thickens the line width of the isolated portion contrary to the case in which the σ value is great, the line widths of the isolated portions of the patterns P1B, P2B and P3B constituting the mask pattern 41B1 become thicker than the designed value (width obtained by enlarging the parent pattern 41 precisely $1/\beta$ times), the line widths of the periodical pootion of the pattern P1B and periodical P1B and periodical patterns P4B and P5B are the same as the designed values.

Page 38 lines 12-24 through Page 39, lines 1-5, delete current paragraph and insert therefor:

a 14

The projection optical system shown in Figs. 1 and 4 is not limited to a refractive system comprising a plurality of refractive optical elements only, and the projection optical system may be a catadioptric system having the refractive optical elements and reflection optical elements (concave mirror or the like) or a reflection system comprising a plurality of reflection optical elements only. Here, as a catadioptric projection optical system, there exist an optical system having a least a beam splitter as the reflection optical element and a concave mirror, and optical system having the concave mirror and a mirror, without using the beam splitter, as the reflection optical elements, and an optical system in which a pluralilty of reflective optical elements and two reflection optical elements (at least one of them is a concave mirror) are disposed on the same optical axis as disclosed in U.S.P. Nos. 5031976, 5788229 and 5717518, the disclosures of which patents are herein incorporated by reference. The projection optical system shown in Fig 4 may be an equal magnification system or enlarging magnification system.